

WHAT IS CLAIMED IS:

1. A semiconductor device comprising:
  - a Cu film provided above a main surface of a semiconductor substrate and used as a wiring;
  - 5 an intermediate layer formed at least on the Cu film; and
  - an Al film formed on the intermediate layer and used as a pad;

wherein the intermediate layer comprises a refractory metal nitride film and a refractory metal film formed on the refractory metal nitride film.
- 10 2. The semiconductor device according to claim 1, wherein the intermediate layer has a first portion which contacts the Cu film and a second portion which does not contact the Cu film, and an insulating film contacts the second portion.
- 15 3. The semiconductor device according to claim 1, wherein the refractory metal film contains at least one refractory metal and the refractory metal nitride film contains at least one refractory metal that is identical to the at least one refractory metal contained in the refractory metal film.
- 20 4. The semiconductor device according to claim 1, wherein the refractory metal film contains at least one metal selected from the group consisting of Ta, Nb, Ti, W and V, and the refractory metal nitride film contains at least one metal selected from the group consisting

of Ta, Nb, Ti, W and V.

5. A semiconductor device comprising:

a Cu film provided above a main surface of  
a semiconductor substrate and used as a wiring;

5 an intermediate layer formed at least on the Cu  
film; and

an Al film formed on the intermediate layer and  
used as a pad;

10 wherein the intermediate layer comprises a  
refractory metal film and a refractory metal nitride  
film formed on the refractory metal film.

15 6. The semiconductor device according to claim 5,  
wherein the intermediate layer has a first portion  
which contacts the Cu film and a second portion which  
does not contact the Cu film, and an insulating film  
contacts the second portion.

20 7. The semiconductor device according to claim 5,  
wherein the refractory metal film contains at least  
one refractory metal and the refractory metal nitride  
film contains at least one refractory metal that is  
identical to the at least one refractory metal  
contained in the refractory metal film.

25 8. The semiconductor device according to claim 5,  
wherein the refractory metal film contains at least one  
metal selected from the group consisting of Ta, Nb, Ti,  
W and V, and the refractory metal nitride film contains  
at least one metal selected from the group consisting

of Ta, Nb, Ti, W and V.

9. A semiconductor device comprising:

a Cu film provided above a main surface of  
a semiconductor substrate and used as a wiring;

5 an intermediate layer formed at least on the Cu  
film; and

an Al film formed on the intermediate layer and  
used as a pad;

10 wherein the intermediate layer comprises a first  
refractory metal film, a refractory metal nitride film  
formed on the first refractory metal film, and a second  
refractory metal film formed on the refractory metal  
nitride film.

15 10. The semiconductor device according to claim 9,  
wherein the intermediate layer has a first portion  
which contacts the Cu film and a second portion which  
does not contact the Cu film, and an insulating film  
contacts the second portion.

20 11. The semiconductor device according to claim 9,  
wherein the first refractory metal film contains at  
least one refractory metal, the refractory metal  
nitride film contains at least one refractory metal  
that is identical to the at least one refractory metal  
contained in the first refractory metal film, and the  
25 second refractory metal film contains at least one  
refractory metal that is identical to the at least one  
refractory metal contained in the first refractory

metal film.

12. The semiconductor device according to claim 9,  
wherein the first refractory metal film contains at  
least one metal selected from the group consisting of  
5 Ta, Nb, Ti, W and V, the refractory metal nitride film  
contains at least one metal selected from the group  
consisting of Ta, Nb, Ti, W and V, and the second  
refractory metal film contains at least one metal  
selected from the group consisting of Ta, Nb, Ti, W  
10 and V.